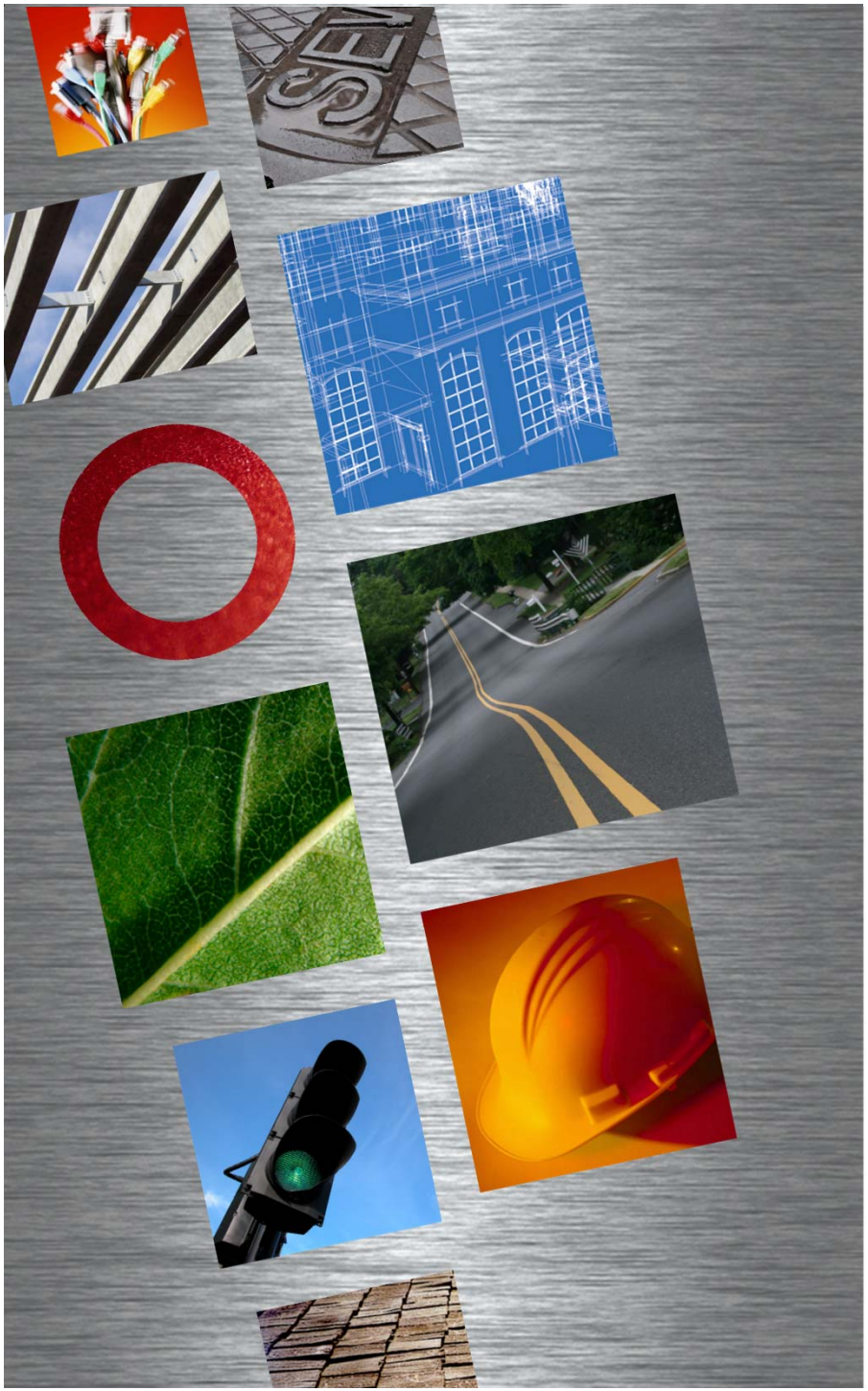


Design Visualization for Transportation Projects

Ting Wei, PE, PTOE, AICP
Paul Jarboe

Presented at
99th Annual Purdue University Road School
March 6, 2013

AMERICAN STRUCTUREPOINT INC.

Presentation Outline

- Types of Visualization
- Benefits
- Goal Setting
- Camera Selection
- Photorealism
- Traffic Integration
- Visualization for Construction Sequence
- Resource Planning

Types of Visualization

- 2D vs. 3D

Yeager Road Roundabout, West Lafayette

US 31 North Terminus, Kokomo

Types of Visualization

- Still Image vs. Animation

Lindberg Road Bridge, West Lafayette

Complete Street Concept, Indianapolis

Benefits of Visualization

- What can visualization help?
  - Educating the drivers
  - Facilitating shareholder communications
  - Evaluating design options
- How to measure the benefits?
  - Most visualization benefits “perceived” or “anecdotal”
  - Almost impossible to associate monetary benefits with visualization

Benefits of Visualization

US 50 Tanners Creek Bridge, Lawrenceburg

Ms. Mueller stated,

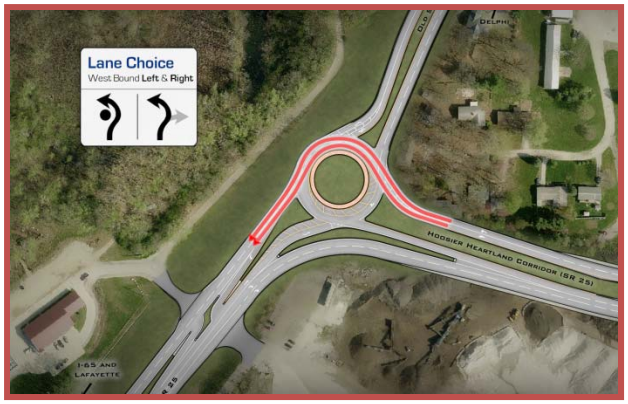
"I was definitely not a fan of the original proposal for this bridge, but after their presentation, which included a really cool simulated drive through all aspects of this region…I told Mayor Bill Cunningham that I liked this plan."

Goal Setting

- A critical step to justify the visualization and plan for resources
  - Specific project obstacles
  - Camera selection
  - Level of photorealism
  - Traffic operations
  - Deliverables

Camera Selection

- Fixed Camera
  - Top view
  - Ground-level view
  - Bird's eye view



Hoosier Heartland Roundabout

State Blvd, Ft. Wayne

Indianapolis Motor Speedway

Camera Selection

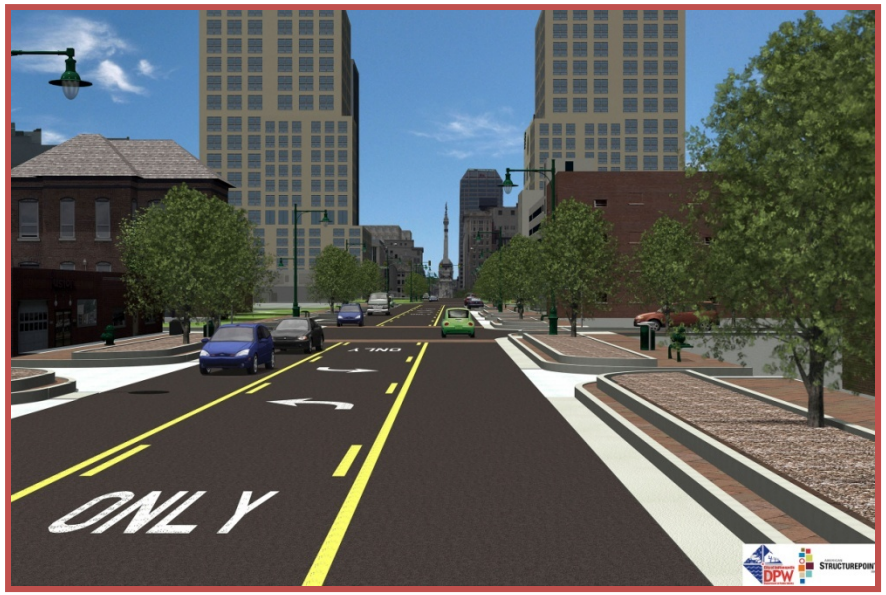
- Moving Camera
  - Orbit
  - Drive through
  - Fly through/follow through

Keystone Ave & 116th St, Carmel

18th St, Logansport

Achieving Photorealism

- Infrastructure Modeling
  - Texture
  - Lighting
  - Vray/Mental ray



Market Street, Indianapolis

Indianapolis Motor Speedway

Achieving Photorealism

- Background modeling
  - 3D background modeling vs. photo compositing

All 3D Max Geometry

18th Street, Logansport

Photo Composite

Prairie Street, Elkhart

Visualization vs. Actual Photo

Visualization with Photo Composite

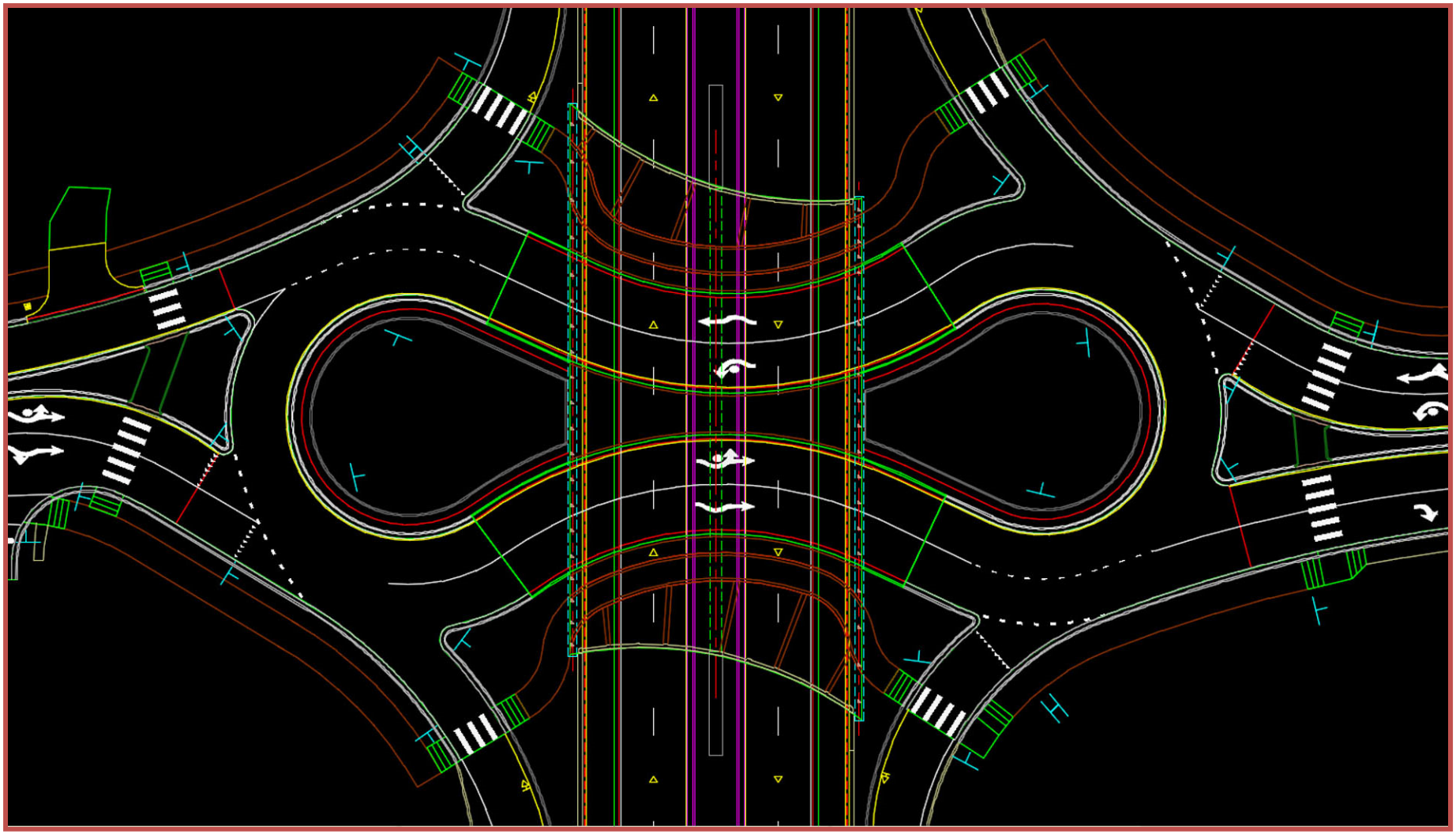
As Built Aerial Photo

Keystone Ave & 131st St, Carmel

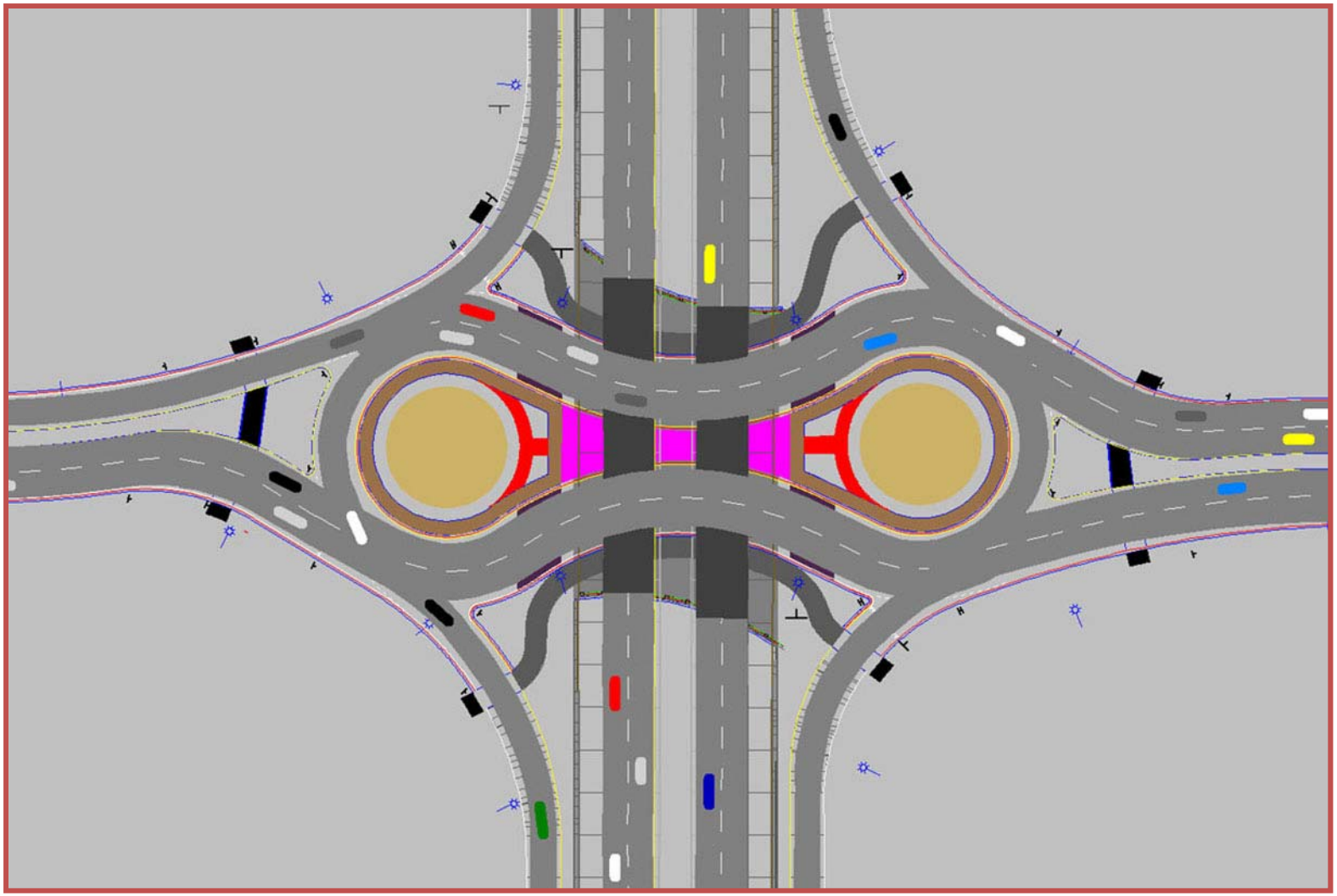
Traffic Integration

- What is traffic integration?
  - Integration of traffic simulation into design visualization
  - To deliver a two-fold message for the project: it looks good and it works well!
- Challenges
  - 3D software not capable of producing interactive traffic movements
  - Traffic simulation software not capable of producing photorealism

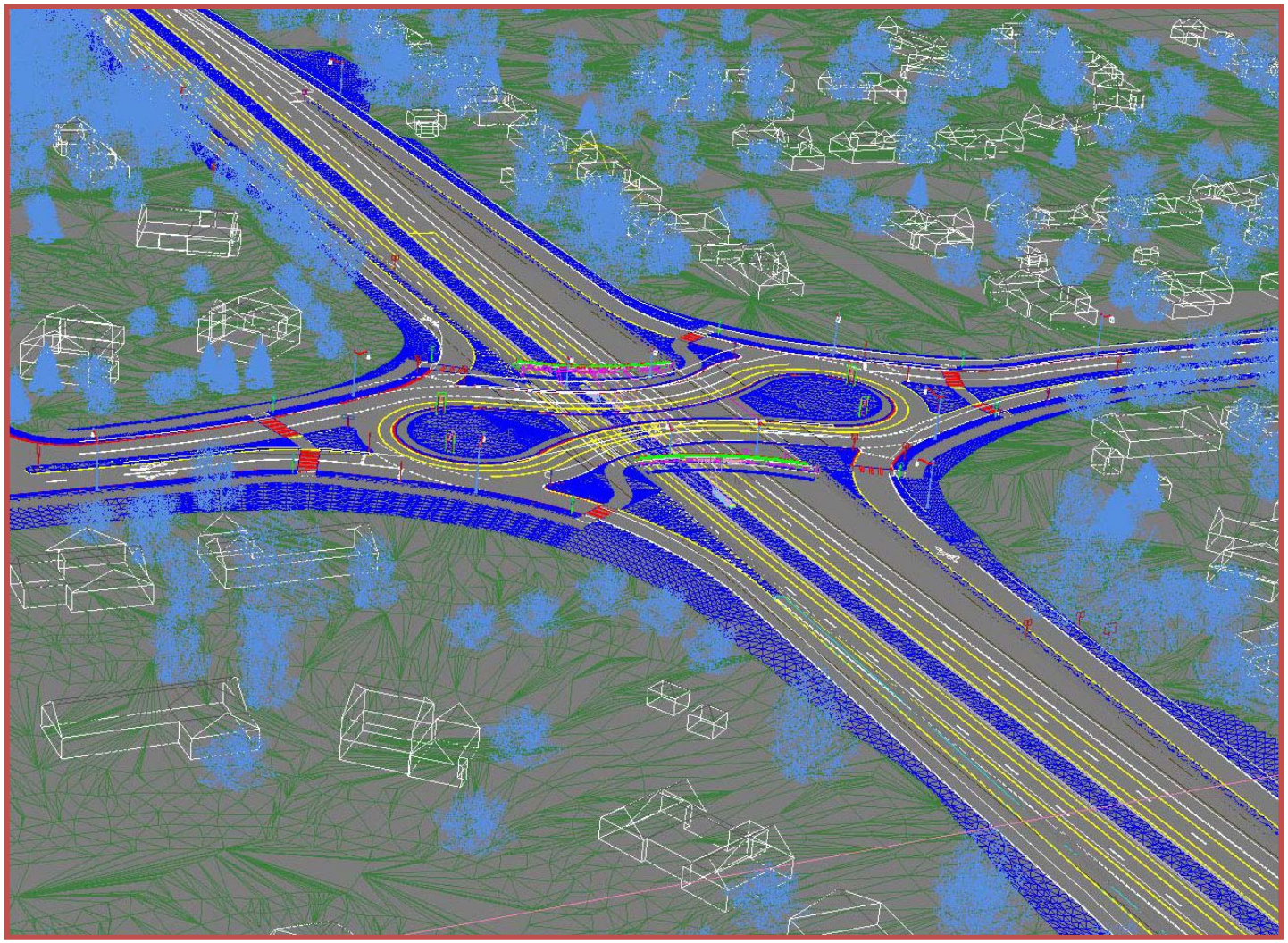
Example: Step 1



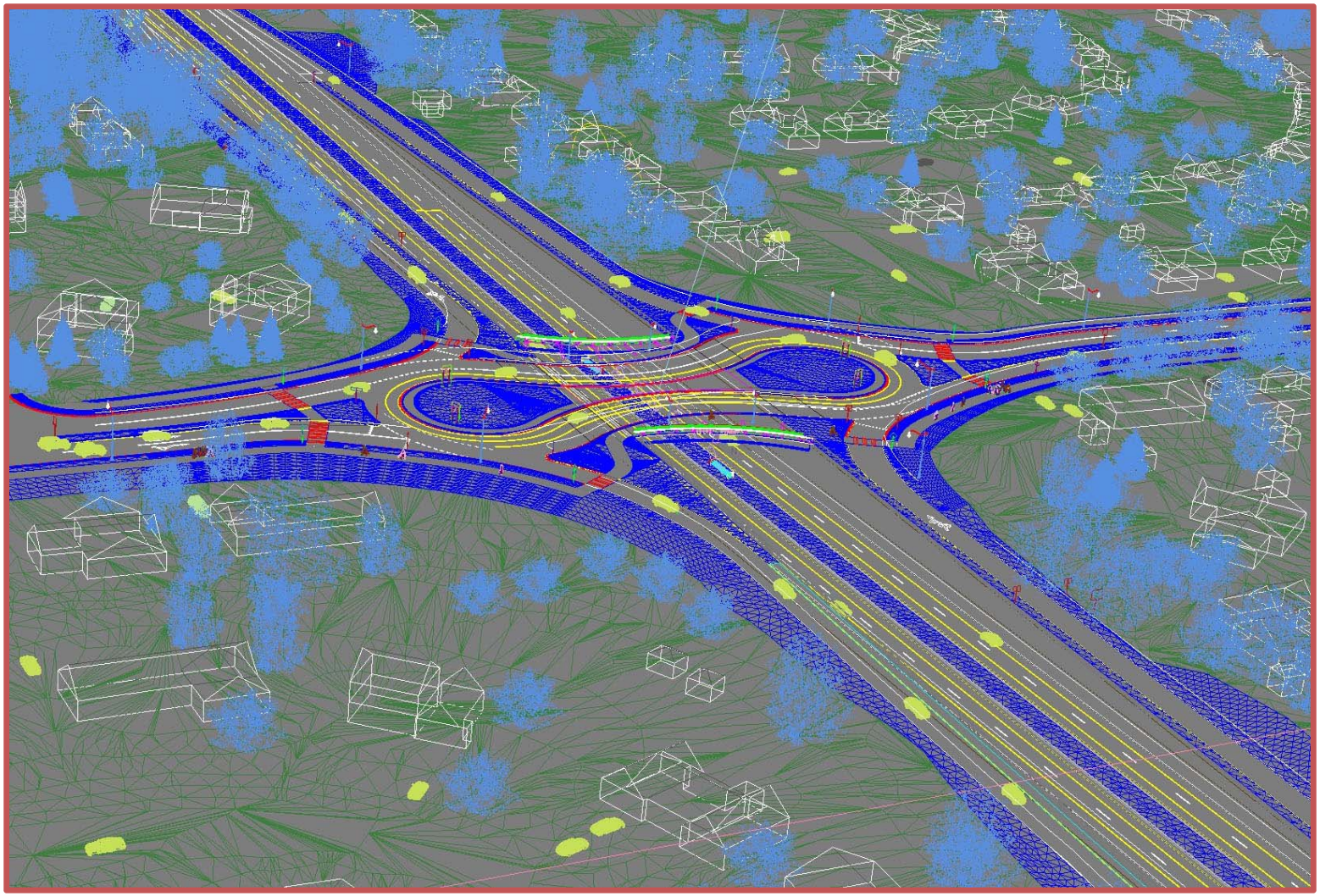
Example: Step 2



Example: Step 2 (Cont'd)



Example: Step 3



Example: Step 3 (Cont'd)

Example: Step 4

Visualization for Construction Sequence

- Traditionally overlooked due to lack of perceived benefits
- Effective in illustrating maintenance of traffic for design refinement and public education
- Developed based on the visualization of the final products

Example: Pre-Construction

Example: Phase 1

Example: Phase 2

Example: Phase 3

Example: Phase 4

Example: Post Construction

Deliverable for Visualization

- Web-friendly formats:
  - jpg/png/pdf
  - Flash/h.264/wmv
- Bring-home formats:
  - Printout
  - DVD
- Interactive formats:
  - Driving simulators/mobile apps
  - Virtual Reality (VR)

Resource Planning

- Finding the most efficient visualization path for each project:
  - No one-size-fits-all solution
  - Depends on goals and available resources
  - Sometimes cheaper solutions can do just fine
    - Traffic simulation to address operational concerns
    - AutoTurn in CAD to address design vehicle swept path

How Much Effort Does It Take?

Visualization Format	Camera	Traffic	Design Modeling	Background Modeling	Photo-Realism	Resource	Typical Timeline
Still Image	Fixed (Top View)	No	2D Elements	Ex. Aerial	Low	Low	< 1 Week
	Fixed (Bird's Eye)	No	3D Elements	Photo Composite	High	Medium	1-2 Weeks
Animation	Fixed (Bird's Eye)	Yes	3D Elements	Photo Composite	High	Medium	2-4 Weeks
	Moving	Yes	3D Elements	3D Elements	High	High	1-2 Months

*Based on a single intersection or a service interchange

Questions

- Contact Info:
  - Ting Wei twei@structurepoint.com
  - Paul Jarboe pjarboe@structurepoint.com